UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/086,087	02/28/2002	Zhihao Yang	83426HEC	2857

7590 05/31/2005

Paul A. Leipold
Patent Legal Staff
Eastman Kodak Company
343 State Street
Rochester, NY 14650-2201

EXAMINER	
O FARRELL, THOMAS JOHN	
ART UNIT	**PAPER NUMBER**
1634	

DATE MAILED: 05/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/086,087	YANG ET AL.	
	Examiner	Art Unit	
	Thomas J. O'Farrell	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02/28/2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/2002*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

5/10 -

DETAILED ACTION

Claim Objections

1. Claim 9 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Instant claim 9 does not further limit instant claim 1. The method of fabrication of the microfluidic device recited in instant claim 9 does not appear to limit the method of linearizing DNA recited in instant claim 1, because instant claim 1 recites no steps directed to methods of fabricating a device.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding instant claim 1.c reciting "passing said hybridized DNA complex in a random coil state from a reservoir in a microfluidic device through a narrow channel to

cause an acceleration of flow through said channel", it is unclear whether the hybridized DNA complex and/or the fluid flowing through the channel is accelerated in this step. Additionally, it is unclear as to what process actually causes the "acceleration of flow" through the narrow channel. It is also unclear as to whether there is a brief or continuous acceleration of flow in the narrow channel. Additionally, it is unclear as to whether the passage of the DNA complex from a reservoir through a narrow channel or the acceleration of flow through the narrow channel causes the hybridized DNA complex to extend into a substantially linear configuration. Clarification is required.

4. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as failing to limit the subject matter of a previous claim.

Instant claim 9 is indefinite because it appears to limit method steps that are not recited in the claim from which it depends. Instant claim 1 is drawn to a method for identifying DNA and does not include any steps directed to fabrication of a microfluidic device. In further limiting how a microfluidic device was fabricated, instant claim 9 appears to be further limiting a method step that is not recited in instant claim 1. It is unclear how the method of fabrication of the microfluidic device recited in instant claim 9 limits the method of linearizing DNA recited in instant claim 1. Consequently, the metes and bounds of instant claim 9 are unclear.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-6 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Bensimon et al (herein referred to as Bensimon, U.S. Patent 6,054,327, 102(b) date 04/25/2000).

Several aspects of instant claim 1.c have been broadly interpreted by the examiner. Passing the hybridized DNA complex "from a reservoir in a microfluidic device" is interpreted as moving any portion of the hybridized DNA complex initially in a holding area in a device designed to contain small amounts of liquids. Passing the hybridized DNA complex through a "narrow channel to cause an acceleration of flow through said channel" is interpreted as moving any portion of the hybridized DNA complex through a small passageway, which involves an acceleration of flow through the passageway.

Bensimon teaches a method of analyzing DNA comprising hybridizing the DNA in solution with probes having fluorescent reagents and then detecting the position of the

probes after aligning ("causing said hybridized DNA complex to extend into a substantially linear configuration", instant claim 1.c) the DNA (instant claims 1, 5 and 6; see column 16, lines 50-55, and Fig. 6 of Bensimon). Bensimon also teaches that DNA molecules placed in a channel between cover slips can be aligned by the evaporation flow parallel to a moving meniscus in the channel (instant claim 1.c; see column 2, lines 11-12 and column 3, line 22 and Fig. 6 of Bensimon). Regarding this method of aligning DNA described by Bensimon, DNA molecules in a random coil state fixed at a location in a channel between cover slips is interpreted as the embodiment of the hybridized DNA complex initially being in a "reservoir in a microfluidic device" as recited in instant claim 1.c. In addition, as the meniscus initially moves through the channel between the cover slips, there will be an acceleration of fluid flow in the channel and a portion of the DNA complex will pass through the channel as it extends to a linear configuration (see Fig. 6 of Bensimon). This is interpreted as the embodiment of passing the hybridized DNA complex through a "narrow channel to cause an acceleration of flow through said channel, thereby causing said hybridized DNA complex to extend into a substantially linear configuration;" (recited in instant claim 1.c). Bensimon teaches that the probes used to hybridize to DNA can be oligonucleotides, RNA, DNA, and peptide nucleic acids (instant claims 5 and 6; see column 13, lines 21-23 and 64-65 of Bensimon). Bensimon also teaches that oligonucleotide probes can be labeled with fluorescent labels and microbeads (instant claims 2-4; see column 11, lines 20-41 and column 14, lines 4-7 of Bensimon). With regard to instant claim 9, the technique by which the microfluidic device was fabricated does not limit the method of linearizing the hybridized DNA in

claim 1, therefore it is given no patentable weight. With regard to instant claim 1.d reciting "detecting said optically distinguishable material in a sequential manner along said substantially linear hybridized DNA complex,...", the recitation is interpreted as detecting *one or more* optically distinguishable DNA sequence recognition units in a sequential manner along a substantially linear hybridized DNA complex, which is taught by Bensimon (see column 16, lines 50-55 of Bensimon).

7. Claims 1-6 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Chan et al (hereinafter referred to as Chan-1; Pre Grant Publication 2003/0059822, 102(e) date 09/18/2001).

Chan-1 teaches a method of analyzing a polymer comprising labeling the polymer with first and second unit specific makers, the first unit specific marker having a first label and the second unit specific marker including a second label distinct from the first label; exposing the labeled polymer to a detection station to produce distinct detection signals from the first and second labels; and identifying the distinct first and second signals (instant claim 1; see page 1, para 0008 of Chan-1). Chan-1 also teaches that the first unit specific marker can be different than the second unit specific marker, either in its nature or in the polymer unit it recognizes and binds to (instant claim 1; see page 1, para 0009 of Chan-1). Chan-1 also teaches that the first unit specific marker can be identical to the second unit specific marker, yet the first and second unit specific markers are labeled with distinct labels (instant claim 1; see page 1, para 0009 of Chan-1). Chan-1 also teaches that the polymer is preferably a nucleic

acid that is genomic DNA (instant claim 1; see page 2, para 0013 of Chan-1) and that the unit specific marker can be a nucleic acid probe (instant claims 5 and 6; see page 8, para 0076 of Chan-1), or a peptide or polypeptide or peptide-nucleic acids (instant claims 5 and 6; see page 8, para 0077 of Chan-1). Chan-1 teaches that unit specific markers are attached to optically distinguishable labels that include a fluorescent molecule, a radioisotope, an enzyme, a biotin molecule, an avidin molecule, a semiconductor nanocrystal, a semiconductor nanoparticle, a colloid gold nanocrystal, a micro bead, a protein, a peptide, a nucleic acid, a carbohydrate, an antigen, an antibody, etc. (instant claims 2-4; see page 3, para 0015 of Chan-1). Chan-1 teaches that the pattern of binding of the unit specific markers to the polymer may be determined using a variety of systems including a linear polymer analysis system (instant claim 1; see page 3, para 0033 of Chan-1) such as optical mapping or DNA combing. Chan-1 teaches that the unit specific marker (and thus the polymer) can be sequentially exposed to a station, "station" defined as a region where a portion of the polymer is exposed to an energy source in order to produce a signal or polymer dependent impulse, by movement of the marker and the station relative to one another (instant claim 1; see page 12, para 0109 of Chan-1). Chan-1 teaches that the polymer can be aligned and stretched before it reaches the interaction station and that a very effective technique of stretching DNA is to pass the polymer through a tapered microchannel having an obstacle field, followed by a constant-shear section to maintain the stretching obtained and straighten out any remaining coiling in the polymer (embodiment of "passing said hybridized DNA complex....." in instant claim 1.c; see page 13, para 0125

and page 14, para 0128 of Chan-1). Chan-1 also teaches that pressure flow is the preferred driving force of the DNA through such a microchannel recited above (see page 14, para 0128 of Chan-1). With regard to instant claim 9, the technique by which the microfluidic device was fabricated does not limit the method of linearizing the hybridized DNA in claim 1, therefore it is given no patentable weight. With regard to instant claim 1.d reciting "detecting said optically distinguishable material in a sequential manner along said substantially linear hybridized DNA complex,...", the recitation is interpreted as detecting *one or more* optically distinguishable DNA sequence recognition units in a sequential manner along a substantially linear hybridized DNA complex, which is taught by Chan-1 (see page 1, para 0008 and page 3, para 0033 of Chan-1).

8. Claims 1-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Hannah et al (hereinafter referred to as Hannah; U.S. Patent 6,767,731 B2, 102(e) date 08/27/2001).

Hannah teaches a method of sequencing a target nucleic acid comprising hybridization of the target DNA with probes, which can be oligonucleotides and oligonucleotide analogs that are uniquely and detectably labeled, using a microfluidic device to pass the hybridized nucleic acid through a microchannel to extend it to an approximate linear conformation by hydrodynamic focusing, and detecting the spectral signature of each labeled probe, preferably in sequential order (instant claims 1, 5 and 6; see column 2, lines 38-44 and 51-56, and column 3, lines 3-7 and 9-11 of Hannah).

Hannah also teaches that nucleic acid molecules sequenced by this method can be DNA or RNA (instant claim 1; see column 4, lines 62-65 of Hannah). Hannah also teaches that the probes used for this method can be DNA, RNA, or analog thereof, such as a peptide nucleic acid (instant claims 5 and 6; see column 6, lines 30-34 of Hannah). Hannah also teaches that the probe labels can be fluorescent, luminescent, radioactive, phosphorescent, chemiluminescent, enzymatic, spin, electron dense, mass spectroscopic, semiconductor nanostructures, and quantum dots (instant claims 2-4; see column 8, lines 42-47 and column 10, lines 12-37 of Hannah). Hannah also teaches that photolithography can be used to obtain microchannels for use in linearizing DNA in the range of tens of micrometers wide and deep (instant claims 7-9; see column 12, lines 14-16 of Hannah). Instant claim 9 is interpreted to be an extra method step in instant claim 1 for fabricating the microfluidic device used for stretching DNA. In addition, Hannah teaches that microfluidic devices can be fabricated by wet chemical etching and micromachining (instant claim 9; see column 12, lines 30-34 of Hannah). With regard to instant claim 1.d reciting "detecting said optically distinguishable material in a sequential manner along said substantially linear hybridized DNA complex,...", the recitation is interpreted as detecting *one or more* optically distinguishable DNA sequence recognition units in a sequential manner along a substantially linear hybridized DNA complex, which is taught by Hannah (see column 2, lines 38-44 and 51-56, and column 3, lines 3-7 and 9-11 of Hannah).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bensimon, in view of Chan-2 (hereinafter referred to as Chan-2; PCT/US00/22253, International Publication Number WO 01/13088 A1, International Publication Date 02/22/2001).

For the instant rejection, the recited phrase "from a reservoir in a microfluidic device " is interpreted as the hybridized DNA initially being in a separate chamber in a device having channels with dimensions in the micrometer range. In addition, passing the hybridized DNA complex through a "narrow channel to cause an acceleration of flow

through said channel, thereby causing said hybridized DNA complex to extend into a substantially linear configuration;" is interpreted as the entire hybridized DNA complex being passed through a narrow channel and extended to a linear configuration due to the hydrodynamic forces associated with the accelerated microfluidic flow of the fluid containing the hybridized DNA complex through the channel.

Bensimon teaches a method of analyzing DNA comprising hybridizing the DNA in solution with probes having fluorescent reagents and then detecting the position of the probes after aligning ("causing said hybridized DNA complex to extend into a substantially linear configuration", instant claim 1.c) the DNA (instant claims 1, 5 and 6; see column 16, lines 50-55, and Fig. 6 of Bensimon). Bensimon also teaches that DNA molecules placed in a channel between cover slips can be aligned by the evaporation flow parallel to a moving meniscus in the channel (instant claim 1.c; see column 2, lines 11-12 and column 3, line 22 and Fig. 6 of Bensimon). Bensimon also teaches that the probes used to hybridize to DNA can be oligonucleotides, RNA, DNA, and peptide nucleic acids (instant claims 5 and 6; see column 13, lines 21-23 and 64-65 of Bensimon). Bensimon also teaches that oligonucleotide probes can be labeled with fluorescent labels and microbeads (instant claims 2-4; see column 11, lines 20-41, and column 14, lines 4-7 of Bensimon). With regard to instant claim 1.d reciting "detecting said optically distinguishable material in a sequential manner along said substantially linear hybridized DNA complex,...", the recitation is interpreted as detecting *one or more* optically distinguishable DNA sequence recognition units in a sequential manner

along a substantially linear hybridized DNA complex, which is taught by Bensimon (see column 16, lines 50-55 of Bensimon).

Bensimon does not teach a method of linearizing a hybridized DNA complex by hydrodynamic force employing a microfluidic device, having dimensions in the micrometer range, to pass the entire hybridized DNA complex from a separate reservoir into a narrow channel. However, Chan-2 teaches that since microfluidic devices allow multiple molecules to be stretched in succession, extremely high throughput screening can be achieved (instant claims 1-9; see page 20, lines 25-27 of Chan-2). In addition, Chan-2 teaches that the method of linearizing DNA used by Bensimon, known as "molecular combing", cannot be easily adapted to a high-throughput operation because the immobilization of the polymers is a rate-limiting step and further modification of the polymers is more difficult after immobilization (see page 5, lines 15-17 of Chan-2). Chan-2 also teaches that molecular combing and other polymer stretching techniques are lacking in the uniformity and reproducibility of stretching, ease of handling of the biopolymer, applicability to all types and sizes of biopolymers, and the ability to rapidly analyze information (see page 7, lines 33-36 of Chan-2). Chan-2 also teaches detailed microfluidic polymer stretching structures, which enable stretching by hydrodynamic force, with various widths and depths and accompanying stretching methods (see Figures 1-23; page 26, lines 5-35; page 39, lines 29-36, and page 40, lines 1-10 of Chan-2). Specifically, Chan-2 teaches that a channel with 1 μm depth, 1 mm length, and a shear rate of 0.25/s gives a force of approximately 0.25 pN, which the inventors have verified experimentally is adequate to stretch DNA (instant claims 7 and 8; see

page 25, lines 16-20 of Chan-2). Instant claim 9 is interpreted to be an extra method step in instant claim 1 for fabricating the microfluidic device used for stretching DNA. Bensimon does not teach a method for the fabrication of microfluidic devices. However, Chan-2 teaches that microfluidic structures used for stretching DNA can be fabricated by lithography, such as e-beam lithography, deep–ultraviolet lithography, photolithography, LIGA, and elastomeric molding (instant claim 9; see page 37, lines 23-27 of Chan-2). Therefore, it would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to improve the method of linearizing DNA taught by Bensimon in the method of DNA analysis taught by Bensimon with the DNA linearzing method taught by Chan-2 because Chan-2 teaches that this method for linearizing DNA is capable of extremely high-throughput operation and allows rapid analysis on a reasonable timescale. The ordinary artisan would have been motivated to replace the method of linearizing DNA taught by Bensimon with the method of linearizing DNA taught by Chan-2 for the purpose of improving the method of Bensimon because Chan-2 teaches that molecular combing as taught Bensimon cannot be easily adapted to a high-throughput operation and is incapable of rapid analysis of information, while the method of Chan-2 is readily capable of extremely high-throughput operation and rapid analysis of information. In addition, Chan-2 teaches specific examples of microfluidic structures for stretching DNA with their dimensions and the methods for fabrication of such structures.

12. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan-1, in view of Chan et al (hereinafter referred to as Chan-2; PCT/US00/22253, International Publication Number WO 01/13088 A1, International Publication Date 02/22/2001).

Chan-1 teaches a method of analyzing a polymer comprising labeling the polymer with first and second unit specific makers, the first unit specific marker having a first label and the second unit specific marker including a second label distinct from the first label; exposing the labeled polymer to a detection station to produce distinct detection signals from the first and second labels; and identifying the distinct first and second signals (instant claim 1; see page 1, para 0008 of Chan-1). Chan-1 also teaches that the first unit specific marker can be different than the second unit specific marker, either in its nature or in the polymer unit it recognizes and binds to (instant claim 1; see page 1, para 0009 of Chan-1). Chan-1 also teaches that the first unit specific marker can be identical to the second unit specific marker, yet the first and second unit specific markers are labeled with distinct labels (instant claim 1; see page 1, para 0009 of Chan-1). Chan-1 also teaches that the polymer is preferably a nucleic acid that is genomic DNA (instant claim 1; see page 2, para 0013 of Chan-1) and that the unit specific marker can be a nucleic acid probe (instant claims 5 and 6; see page 8, para 0076 of Chan-1), or a peptide or polypeptide or peptide-nucleic acids (instant claims 5 and 6; see page 8, para 0077 of Chan-1). Chan-1 teaches that unit specific markers are attached to optically distinguishable labels that include a fluorescent molecule, a radioisotope, an enzyme, a biotin molecule, an avidin molecule, a

semiconductor nanocrystal, a semiconductor nanoparticle, a colloid gold nanocrystal, a micro bead, a protein, a peptide, a nucleic acid, a carbohydrate, an antigen, an antibody, etc. (instant claims 2-4; see page 3, para 0015 of Chan-1). Chan-1 teaches that the pattern of binding of the unit specific markers to the polymer may be determined using a variety of systems including a linear polymer analysis system (instant claim 1; see page 3, para 0033 of Chan-1) such as optical mapping or DNA combing. Chan-1 teaches that the unit specific marker (and thus the polymer) can be sequentially exposed to a station, "station" defined as a region where a portion of the polymer is exposed to an energy source in order to produce a signal or polymer dependent impulse, by movement of the marker and the station relative to one another (instant claim 1; see page 12, para 0109 of Chan-1). Chan-1 teaches that the polymer can be aligned and stretched before it reaches the interaction station and that a very effective technique of stretching DNA is to pass the polymer through a tapered microchannel having an obstacle field, followed by a constant-shear section to maintain the stretching obtained and straighten out any remaining coiling in the polymer (embodiment of "passing said hybridized DNA complex....." in instant claim 1.c); see page 13, para 0125 and page 14, para 0128 of Chan-1). Chan-1 teaches that pressure flow is the preferred driving force of the DNA through such a microchannel recited above (see page 14, para 0128 of Chan-1). With regard to instant claim 1.d) reciting "detecting said optically distinguishable material in a sequential manner along said substantially linear hybridized DNA complex,...", the recitation is interpreted as detecting *one or more* optically distinguishable DNA sequence recognition units in a sequential manner along

a substantially linear hybridized DNA complex, which is taught by Chan-1 (see page 1, para 0008 and page 3, para 0033 of Chan-1).

Chan-1 teaches stretching DNA by passing the DNA through a microchannel, but is silent with respect to the width or depth of the channel (see page 13, para 0125 and page 14, para 0128 of Chan-1). However, Chan-2 teaches that a channel with 1 μm depth, 1 mm length, and a shear rate of 0.25/s gives a force of approximately 0.25 pN, which the inventors have verified experimentally is adequate to stretch DNA (instant claims 7 and 8; see page 25, line 16 of Chan-2). Instant claim 9 is interpreted to be an extra method step in instant claim 1 for fabricating the microfluidic device used for stretching DNA. Chan-1 does not teach a method of fabricating microfluidic structures. However, Chan-2 teaches that microfluidic structures can be fabricated by lithography, such as e-beam lithography, deep–ultraviolet lithography, photolithography, LIGA, and elastomeric molding (instant claim 9; see page 37, line 23 of Chan-2). Therefore, it would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to perform the method of Chan-1 with the device of Chan-2 because Chan-2 specifically teaches a device for performing the method of Chan-1. The ordinary artisan would have been motivated to use the device of Chan-2 because Chan-1, while generally teaching a method of stretching DNA with a microfluidic device, is silent with regard to the specific structure and dimensions of the device. The device, with its specific dimensions, taught by Chan-2 functions to stretch DNA as taught by Chan-1. The ordinary artisan would be motivated to use the device of Chan-2 in the

method of Chan-1 because Chan-1 teaches to stretch DNA by passing the DNA through a microchannel, but no specific structure or dimensions of the microchannel are recited.

Conclusion

13. No claims are allowable over the cited prior art.

14. Any inquiry concerning this communication or earlier communication from the examiner should be made to examiner Thomas O'Farrell whose telephone number is 571-272-8782. The examiner can normally be reached Monday-Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Jones, can be reached at 571-272-0745. The fax number for this Group is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to 571-272-0547.

Patent applicants with problems or questions regarding electronic images that can be viewed in the Patent Application Information Retrieval system (PAIR) can now contact the USPTO's Patent Electronic Business Center (Patent EBC) for assistance. Representatives are available to answer your questions daily from 6 am to midnight (EST). The toll free number is (866) 217-9197. When calling please have your application serial or patent number, the type of document you are having an image problem with, the number of pages and the specific nature of the problem. The Patent Electronic Business Center will notify applicants of the resolution of the problem within 5-7 business days. Applicants can also check PAIR to confirm that the problem has been corrected. The USPTO's Patent Electronic Business Center is a complete service center supporting all patent business on the Internet. The USPTO's PAIR system provides Internet-based access to patent application status and history information. It also enables applicants to view the scanned images of their own application file folder(s) as well as general patent information available to the public.

For all other customer support, please call the USPTO Call Center (UCC) at 800-786-9199.

Thomas O'Farrell
Examiner
Art Unit 1634
5/27/05

JEHANNE SITTON
PRIMARY EXAMINER
5/27/05